

February 17, 2016



U.S. Department  
of Transportation

East Building, PHH-30  
1200 New Jersey Avenue S.E.  
Washington, D.C. 20590

**Pipeline and Hazardous  
Materials Safety Administration**

DOT-SP 16219  
(SECOND REVISION)

**EXPIRATION DATE: March 31, 2017**

1. GRANTEE: Structural Composites Industries (SCI)  
Pomona, CA
2. PURPOSE AND LIMITATION:
  - a. This special permit authorizes the manufacture, marking and sale and use of non-DOT specification fully-wrapped carbon fiber composite cylinder with a seamless aluminum liner that meets all requirements of the ISO 11119-2 Standard except as specified herein. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.
  - b. The safety analyses performed in development of this special permit only considered the hazards and risks associated with transportation in commerce. The safety analyses did not consider the hazards and risks associated with consumer use, use as a component of a transport vehicle or other device, or other uses not associated with transportation in commerce.
  - c. No party status will be granted to this special permit.
3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.
4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR § 172.101 Table, Column (9B) in that the quantity limitation for cargo aircraft is exceeded and §§ 173.302a(a)(1) and 173.304a(a)(1) in that non-DOT specification cylinders are not authorized, except as specified herein.

**February 17, 2016**

5. BASIS: This special permit is based on the application of Structural Composites Industries (SCI) dated June 16, 2015, and additional information dated January 9, 2016 submitted in accordance with §§ 107.105 and the public proceeding thereon.
6. HAZARDOUS MATERIALS (49 CFR § 172.101):

<b>Hazardous Materials Description</b>			
<b>Proper shipping name</b>	<b>Hazard Class/ Division</b>	<b>Identification Number</b>	<b>Packing Group</b>
Air, compressed	2.2	UN1002	N/A
Argon, compressed	2.2	UN1006	N/A
Carbon dioxide	2.2	UN1013	N/A
Carbon monoxide, compressed	2.3	UN1016	N/A
Compressed gas, flammable, n.o.s.	2.1	UN1954	N/A
Compressed gas, n.o.s.	2.2	UN1956	N/A
Compressed gas, oxidizing, n.o.s.	2.2	UN3156	N/A
Helium, compressed	2.2	UN1046	N/A
Hydrogen, compressed	2.1	UN1049	N/A
Krypton, compressed	2.2	UN1056	N/A
Liquefied gas, n.o.s.	2.2	UN3163	N/A
Methane, compressed or Natural gas, compressed (with high methane content)	2.1	UN1971	N/A
Neon, compressed	2.2	UN1065	N/A

February 17, 2016

Hazardous Materials Description			
Proper shipping name	Hazard Class/ Division	Identi- fication Number	Packing Group
Nitrogen, compressed	2.2	UN1066	N/A
Nitrous oxide	2.2	UN1070	N/A
Oxygen, compressed	2.2	UN1072	N/A
Sulfur hexafluoride	2.2	UN1080	N/A
Xenon, compressed	2.2	UN2036	N/A

#### 7. SAFETY CONTROL MEASURES:

a. PACKAGING - Packaging prescribed is a non-DOT specification fully wrapped fiber reinforced composite gas cylinder with aluminum alloy 6061-T6 liner as described in SCI's application on file with the Office of Hazardous Materials Special Permits and Approvals (OHMSPA). Each cylinder must meet all the design and construction requirements for UN composite cylinders specified in § 178.71 (1)(ii) and of ISO 11119-2 Standard: 2002 (Gas cylinders of composite construction - Specification and test methods - Part 2: Fully wrapped fibre reinforced composite gas cylinders with load sharing metal liners):except as follows:

(i) Cylinders made under this special permit have a water volume greater than 10 liters and less than or equal to 325 liters; and are limited to a maximum service pressure of 248 bar (3600 psig).

(ii) All of the design qualification and the batch inspection and testing must be performed in accordance with § 178.71 for ISO 11119-2 except hydraulic cycling pressure testing will be 12,000 cycles between 50 psi to maximum developed service pressure for dedicated gases or 120% of the marked service pressure for all gases.

b. MARKING -

(1) Each cylinder must be permanently marked (other than by stamping) in the composite on the sidewall. The marking must be easily visible and must be protected from external damage due to the environment and handling.

(2) The marking must contain the following:

(i) DOT special permit number (DOT-SP 16219) followed by service pressure expressed in bar (psi).

(ii) A serial number and the manufacturer's identification number or a symbol as obtained from the Associate Administrator for Hazardous Materials Safety, located just below or immediately following the DOT marking above.

(iii) The DOT inspector's official mark must be placed near the serial number. The marking must contain the date (month and year) of the initial hydraulic proof pressure test for that cylinder.

(iv) The size of the letters and numbers used must be at least 0.64 cm (1/4 inch) high if space permits.

(v) The following are examples of an authorized format for marking:

DOT-SP 16219-248 bar(3600 psi)  
1234-MMI (or symbol)  
II-MM/YY

(vi) Additional markings are permitted in the composite, provided the additional markings do not obscure the required marking and are not detrimental to the integrity of the cylinder.

(vii) Provisions for marking of the required requalification dates and RIN information must be made near the cylinder markings.

c. REQUALIFICATION -

(1) **Hydraulic proof pressure test** - Each cylinder must be requalified once every 5 years by a qualified person holding a valid DOT RIN using a hydraulic proof pressure test equal to 1.5 times the marked service pressure and hold the pressure for a minimum of 3 minutes without a loss of pressure.

(i) **Pneumatic Proof Pressure Test** - As an alternative to the hydraulic pressure proof test a valid DOT RIN holder may perform a pneumatic proof pressure test to manifolded cylinders that are permanently fixed in a frame (e.g. ISO frame) or a bundle subject to the following conditions:

(A) Prior to pneumatic proof pressure testing, a complete visual examination as described in this special permit must be completed and all cylinders of the frame must pass the visual examination.

(B) The facility is equipped with a burst chamber, concrete or equivalent barrier wall, or is located with sufficient standoff distance to prevent personnel injury in case of cylinder rupture during the requalification testing.

(C) Each cylinder is pressurized to 1.25 times the marked service pressure. The pressure must be held for 10 consecutive minutes. The loss of pressure during the hold time must not exceed 5% of the original test pressure;

(D) In case of equipment failure during the test which results in loss of pressure prior to the completion of the 10 minute hold time, the test may only be repeated one time; at a pressure of 1.27 times the marked service pressure;

**(2) Visual Inspection** - Each cylinder must be visually inspected in accordance with CGA Pamphlet C-6.2 "Guidelines for Visual Inspection and Re-qualification of Fiber Reinforced High Pressure Cylinder", except as specifically noted herein:

(i) Cylinders with fiber damage (cuts, abrasions, etc.) that exceeds Level 1 type damage as defined in CGA Pamphlet C-6.2 and meet the following depth and length criteria are considered to have Level 2 damage:

(A) Depth - Damage that upon visual inspection is seen to penetrate the outer composite layer but does not expose the carbon layer beneath, or that has a measured depth of greater than 0.005 inch and less than 0.045 inch for cylinders with an outside diameter greater than 7.5 inches or less than 0.035 inch for cylinders 7.5 inches or less in outside diameter;

(B) Length - Damage that has a maximum allowable length of:

Region	Direction of fiber damage	Maximum length of damage
Cylinder sidewall and domes	Transverse to fiber direction (longitudinal direction)	20% of the straight sidewall section length
Cylinder sidewall and domes	In fiber direction (circumferential direction)	20% of the straight sidewall section length

(ii) Cylinders with damage that meets the Level 2 criteria must be rejected. Retesters must contact the cylinder manufacturer in the event that the damage cannot be clearly interpreted based on these criteria. Repair of rejected cylinders is authorized for Level 2 type damage. Repairs

must be made in accordance with CGA Pamphlet C-6.2, prior to the hydrostatic pressure test. Repairs must be evaluated after the hydrostatic test.

(iii) Cylinders that have direct fiber damage that penetrates through the outer composite layer and into the carbon layer, or that have a measured damage depth of greater than the Level 2 maximum are considered to have Level 3 type damage. Cylinders that have damage with depth meeting Level 2, but length exceeding the Level 2 maximum, are considered to have Level 3 type damage. Cylinders with Level 3 type damage are not authorized to be repaired, and must be condemned.

(iv) A hydrostatic requalification may be repeated as provided in § 180.205(g); only two such tests are permitted. Pressurization prior to the official hydrostatic test for the purpose of a systems check may not exceed 85% of the minimum required test pressure.

(3) Persons who perform inspection and testing of cylinders subject to this special permit must comply with § 180.205(b) and with all the terms and conditions of this special permit.

(4) The requalification date (month/year) must be permanently marked on the cylinder as specified in § 180.213. The marking of the RIN symbol on the cylinder certifies compliance with all of the terms and conditions of this special permit.

d. OPERATIONAL CONTROLS -

(1) A cylinder manufactured under this special permit must be removed from service after 15 years from the date of manufacture.

(2) Cylinders may not be used for underwater breathing purposes.

(3) Cylinders used in oxygen service must conform with § 173.302a(a) (5) (i-iv).

(4) Cylinders used in nitrous oxide service must conform with § 173.304a(a)(1).

(5) For cylinders that are permanently mounted inside of a structural frame during transportation, the structural frame must have an appropriate engineering calculation (e.g. Finite Element Analysis (FEA)). The report must be submitted to the Office of Hazardous Materials Special Permits and Approvals. The calculation must demonstrate the framework's ability to protect the cylinders from catastrophic damage (rupture) due to front, rear, or side impact, and rollover. As a minimum, the frame must be designed to meet the following:

(i) All requirements of § 173.301(i);

(ii) The frame design must withstand a static force of eight times the weight of the assembly along the three principle axes, applied individually; and

(iii) The frame design must withstand a static force of seven times longitudinally, three times laterally, and three times vertically, the weight of the structure applied simultaneously.

(6) A cylinder that has been subjected to fire may not be returned to service.

(7) Cylinders filled with mixtures of carbon monoxide and hydrogen must not contain a moisture content in excess of 50 parts per million.

(8) The maximum quantity authorized for cylinders containing mixtures of carbon monoxide and hydrogen is 25 kilograms (kg).

(9) Transportation of Division 2.1 (flammable gas) materials is not authorized aboard cargo vessel and aircraft unless specifically authorized.

(10) All cylinders must be operated and maintained in accordance with Structural Composites Industries Cylinder Component Operations Manual.



8. SPECIAL PROVISIONS:

a. In accordance with the provisions of Paragraph (b) of § 173.22a, persons may use the packaging authorized by this special permit for the transportation of the hazardous materials specified in paragraph 6, only in conformance with the terms of this special permit.

b. A person who is not a holder of this special permit, but receives a packaging covered by this special permit, may reoffer it for transportation provided no modification or change is made to the packaging and it is offered for transportation in conformance with this special permit and the HMR.

c. A current copy of this special permit must be maintained at each facility where the package is offered or reoffered for transportation.

d. A current copy of this special permit must be maintained at each facility where the package is manufactured under this special permit and must be made available to a DOT representative upon request.

e. Each packaging manufactured under the authority of this special permit must be either: (1) marked with the name of the manufacturer and location (city and state) of the facility at which it is manufactured; or (2) marked with a registration symbol designated for a specific manufacturing facility by the Approvals and Permits Division for a specific manufacturing facility.

f. The cylinders described in this special permit are authorized only for normal transportation as an article of commerce i.e., the movement of hazardous materials packages from consignor to consignee.

g. When authorized for transportation by cargo vessel as prescribed in § 172.101, Hazardous Materials Table, flammable gases covered by this special permit must be packed within a closed freight container of steel construction.

h. Each cylinder must be plainly and durably marked "DOT-SP 16219" as specified in § 172.301(c).

9. MODES OF TRANSPORTATION AUTHORIZED: Motor vehicle, rail freight, cargo vessel, and cargo aircraft only.

10. MODAL REQUIREMENTS: A current copy of this special permit must be carried aboard each cargo vessel, aircraft or motor vehicle used to transport packages covered by this special permit. The shipper must furnish a current copy of this special permit to the air carrier before or at the time the shipment is tendered.
11. COMPLIANCE: Failure by a person to comply with any of the following may result in suspension or revocation of this special permit and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. 5101 et seq:
  - o All terms and conditions prescribed in this special permit and the Hazardous Materials Regulations, 49 CFR Parts 171-180.
  - o Persons operating under the terms of this special permit must comply with the security plan requirement in Subpart I of Part 172 of the HMR, when applicable.
  - o Registration required by § 107.601 et seq., when applicable.

Each "Hazmat employee", as defined in § 171.8, who performs a function subject to this special permit must receive training on the requirements and conditions of this special permit in addition to the training required by §§ 172.700 through 172.704.

No person may use or apply this special permit, including display of its number, when this special permit has expired or is otherwise no longer in effect.

Under Title VII of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)- "The Hazardous Materials Safety and Security Reauthorization Act of 2005" (Pub. L. 109-59), 119 Stat. 1144 (August 10, 2005), amended the Federal hazardous materials transportation law by changing the term "exemption" to "special permit" and authorizes a special permit to be granted up to two years for new special permits and up to four years for renewals.

12. REPORTING REQUIREMENTS: Shipments or operations conducted under this special permit are subject to the Hazardous Materials Incident Reporting requirements specified in 49

CFR §§ 171.15 Immediate notice of certain hazardous materials incidents, and 171.16 Detailed hazardous materials incident reports. In addition, the grantee(s) of this special permit must notify the Associate Administrator for Hazardous Materials Safety, in writing, of any incident involving a package, shipment or operation conducted under terms of this special permit.

Issued in Washington, D.C.:



for Dr. Magdy El-Sibaie  
Associate Administrator for Hazardous Materials Safety

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Pipeline and Hazardous Material Safety Administration, U.S. Department of Transportation, East Building PHH-30, 1200 New Jersey Avenue, Southeast, Washington, D.C. 20590.

Copies of this special permit may be obtained by accessing the Hazardous Materials Safety Homepage at [http://hazmat.dot.gov/sp\\_app/special\\_permits/spec\\_perm\\_index.htm](http://hazmat.dot.gov/sp_app/special_permits/spec_perm_index.htm) Photo reproductions and legible reductions of this special permit are permitted. Any alteration of this special permit is prohibited.

PO: BM/MT